

LAPTOP VENDORS JOIN THE FLASH BANDWAGON

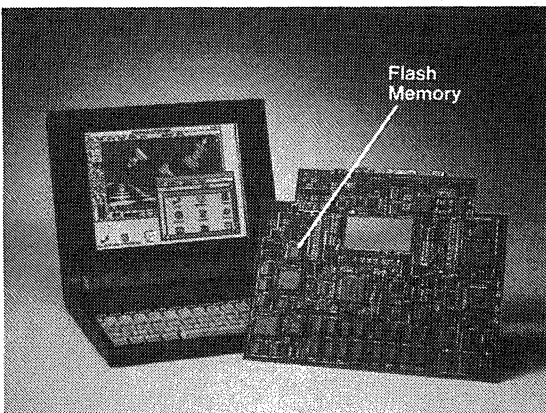
AIRIS'S VH-286 USES FLASH TO STORE BIOS, BUT THAT'S JUST THE BEGINNING OF THE APPLICATION POSSIBILITIES **BY JACK SHANDLE**

WHEN THE founders of Airis Computer Corp. left Zenith Data Systems in 1988 to start a new notebook computer firm, as all entrepreneurs must, that their product strategy had to stand out in a crowd. Flash memory technology (see p. 44) will play a major role in Airis's strategy when the first VH-286 computers start rolling off the production line this month. But Airis is unlikely to be alone for long.

Flash is versatile—it lets clever systems houses such as Airis play with innovative marketing techniques as well as advanced technology. For Chicago-based Airis, the bright idea is TeleROM, says Steve Valentor, engineering vice president. All Airis computers have built-in modems, and by combining that capability with a bank of flash memory that stores system BIOS, Airis can offer users a highly desired feature: instantly updatable BIOS. Simply by dialing into Airis's bulletin board, users will be able to update their BIOS for a nominal charge.

Software-updatable BIOS ensures compatibility with the latest features and software. There are, for example, undocumented features in IBM Corp.'s VGA graphics specification, says Valentor. As these are revealed and utilized in new applications software, Airis users will stay compatible with a phone call.

Airis dedicated 128 Kbytes of flash to BIOS updating: 32 for system BIOS, 32 for video BIOS, and 64 to a program to update the BIOS. Patents have been



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The BIOS in Airis's laptops is stored in a bank of flash memory. With TeleROM, BIOS can be updated by modem.

requested for the updating scheme. In particular, provisions must be made for the possibility that system power may be lost during the BIOS update. "You have to be sure you have enough BIOS available at all times to boot the system," Valentor says. Airis purchases its flash chips from Seeq Technology Inc., San Jose, Calif., because they offer a sector-erase feature that helps implement the fail-safe updating procedure.

Storing BIOS is just the beginning for flash applications. John Wharton, a contributing editor to the *Microprocessor Report*, a Sebastapol, Calif.-based newsletter, says there is more to come. Conventional PC-memory systems are organized on three-levels: rotating mass storage, dynamic random-access memory, and static RAM cache, he says. Each level adds expense in the form of control logic, interconnects, access time, and reliability. "If executable programs and data are all already on-line in moderately fast

memory," he says, "why copy them to an intermediate DRAM first? As larger caches migrate into the central processing unit, the performance characteristics of external memory become less critical." Several companies are hard at work leveling the conventional three-tier memory architecture by means of flash-based "silicon disks."

Among them is Psion Inc. The Watertown, Conn., company employs small flash-based modules as replacements for floppy disks. And at least one company—SunDisk Corp. of Santa Clara, Calif.—is building a flash-based storage system to replace Winchester drives. Flash could even be used to store applications software, but cost and reliability in massive read/erase/write environments continue to be inhibitors to widespread acceptance.

Besides the advantages to laptop and notebook end-users, flash offers considerable advantages in manufacturing, says John Wagner, manager of Zenith Data Systems' Portable Products Development Group, Mt. Prospect, Ill. Although Zenith has not yet implemented flash, it is studying the technology closely in part because of manufacturing issues. "Producing a machine requires several stages of firmware development," he says, "and using flash memory would let us implement the latest version in the final stages of manufacturing. You can also include the latest BIOS and system configuration on a floppy."

Psion is already using flash as a floppy-drive stand-in. Its Flash Packs use 1

Mbyte of Intel Corp. flash chips and measure about 1 by 2 in., says Brian James, marketing support manager. Flash Packs can be used as rewritable storage or as a medium for applications programs. Right now, users must download applications programs from a desktop PC to the Psion notebook computer, but licensing agreements with major software houses should be in place by 1991 that will make memory-card versions of popular MS-DOS software available. Price is high: \$650 for a 1-Mbyte card.

The most controversial application for flash is mass storage. Whether it will one day supplant Winchester depends on the balance of the technology's strengths and weaknesses. For notebooks, laptops, and portables, flash will save valuable real estate, says Zenith's Wagner. But just as important is its form-factor flexibility.

"Flash devices can fit into unusual space configurations within the cabinet. You don't have to lock up space for a drive early in the design cycle," he says. They are also immune to the

read/write-head failures of rotating media, he says, and are at least 10 times faster than rotating media.

FLASH'S BIG DRAWBACK IS cost: a 20-Mbyte flash-based storage device would cost an outrageous \$4,800 at today's prices, says Airis's Valentor. That compares with an OEM price of \$300 for a 2.5-in Winchester. But Valentor points out that the access-time differential between silicon and rotating media must be traded off against the cost differential.

"Using data-compression techniques, you can reduce the number of chips needed to store a given amount of data and still deliver performance better than or equal to hard-disk storage," he says. "In the next two years, we could start to see flash drives at about twice the cost of rotating memory, and that will make flash's form-factor and performance advantages more attractive."

Flash's advantage in power consumption speaks directly to the concerns of portable PCs. Somewhat surprisingly, power consumption is "about a wash in access mode," says

Wagner, but in nonaccess mode, the disk continues to spin while flash goes to near zero. "You have to look at the peak voltage [12- or 5-V erase, depending on vendor] and how many times you use it," Wagner says. "Changing BIOS does not happen often, so it is not an issue there, but in mass storage, erases happen much more frequently."

Though the biggest market inhibitor is cost, flash also has a reliability issue to deal with, and Airis is taking a wait-and-see posture on mass storage. "At this point in time," says Valentor, "I do not believe the parts have the number of reprogramming cycles needed for a hard-disk replacement, but there is not a fundamental inhibitor to longer life, and I expect to see their longevity improve." Intel's chips lead the pack with 100,000 erase and reprogram cycles, but Valentor points out that a portable or laptop running a spreadsheet program, for example, reads and writes to the same portion of the disk. This means that in a flash-based device some chips would be used much more than others. ■

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Store Data in a Flash